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User's manual

SEMS & SEMS LIGHT

Shielding Effectiveness Measurement System

Updated to the software Version:
SEMS RX 1.32
SEMS TX 1.05
SEMS PC Utility 1.26

MPB 2014 ver. 2_10

SAFETY NOTE

Read before using the product

MPB works to provide to its customers the best safety conditions available complying with the current safety standards.
The instrumentation described in this manual has been produced, tested and left the factory in conditions that fully comply the European standards.
To maintain it in safe conditions and ensure the correct use, these general instructions must be fully understood and applied before using the product.
The SEMS is designed for industrial environment and laboratories and should be used by skilled staff only.
MPB disclaims responsibility for a different use of the device.

Conformity Certificate

(in accordance with the ISO/IEC 17050-1)

This is to certify that the product: SEMS / SEMS LIGHT
(Measurement system of shielding effectiveness)

complies with the following European Standards:
Safety: CEI EN 61010-1 (2002)
EMC: EN 61326-1 (2007)

This product complies with the requirements of the Low Voltage Directive 2006/95/CE, and with the EMC Directive 2004/108/CE.

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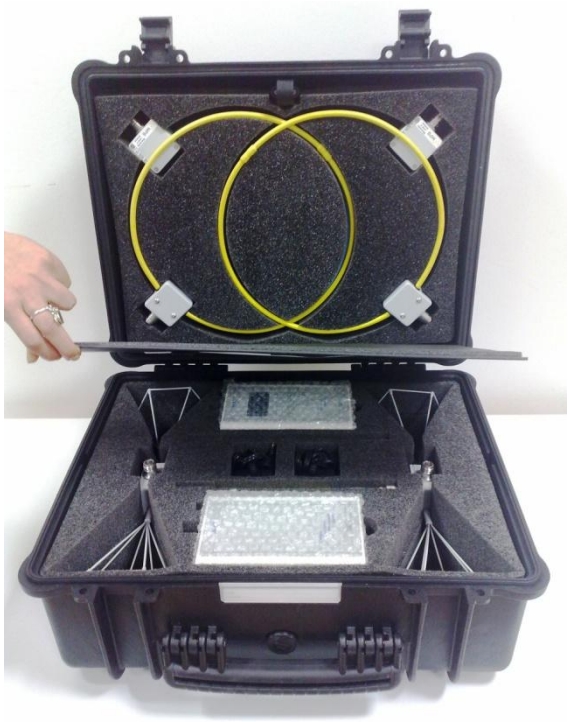
1. General information

1.1. Introduction

SEMS is thought to comply the raising need to test and verify the shielding effectiveness of shielded environment in hospitals and industries.
This system allows to measure automatically with high speed and accuracy the attenuation value of the magnetic and electric field in shielded environments.

1.2. System description

The shielding effectiveness measurement system has a transmitter and a receiver, both of them are provided with a pair of very small antennas, to measure the magnetic and electric field attenuation.
Contrary to today's available systems, that measure the shielding effectiveness on few frequency points, SEMS allows to perform a complete test on the whole frequency ranges continuously. Another improvement compared to the standard system is the synchronization component, TX and RX are connected by a wireless system that allows to perform automatically the measurement minimizing the user's errors.



Picture n°01

SEMS System

1.3. Composition of the system and optional accessories

Model	SEMS KIT 1	SEMS LIGHT
RX Unit (10kHz…300MHz)	✓	Only until 96MHz
TX Unit (10kHz…300MHz)	✓	✓
Biconical antennas Mod. B1 (60…300MHz)	✓	○
Rod antennas Mod. R1 (1…60MHz)	○	○
Loop antennas Mod. L1 (2…128MHz)	✓	✓
Loop antennas Mod. L2 (10kHz…4MHz)	○	○
Loop antennas Mod. L3 for RF Leak	○	○
Dipole antennas Mod. D1 (40…300MHz)	○	○
RS/232 Wireless Key Bluetooth technology	✓	✓
RS232/USB cable to download memory of the SEMS and for programming	✓	✓
Battery Charges	✓	✓
Carrying bag Mod. SEMS-CC	✓	✓
Antenna adapters N(m)-N(m)	✓	✓
Cal-Kit 4 attenuators 30 dB/each	○	○
Cal-Kit Accredia Certificate	○	○
Woden tripode Mod. TR-02 Hight adjustable	○	○
Optical link Mod. LO with 20m fiber	○	○
Software Mod. SEMS-SW	✓	✓
User's manual onto USB key	✓	✓
Standard Calibration Certificate SEMS-STD	✓	✓

Option ○

Loop Mod. L-2

Rod Mod.R1

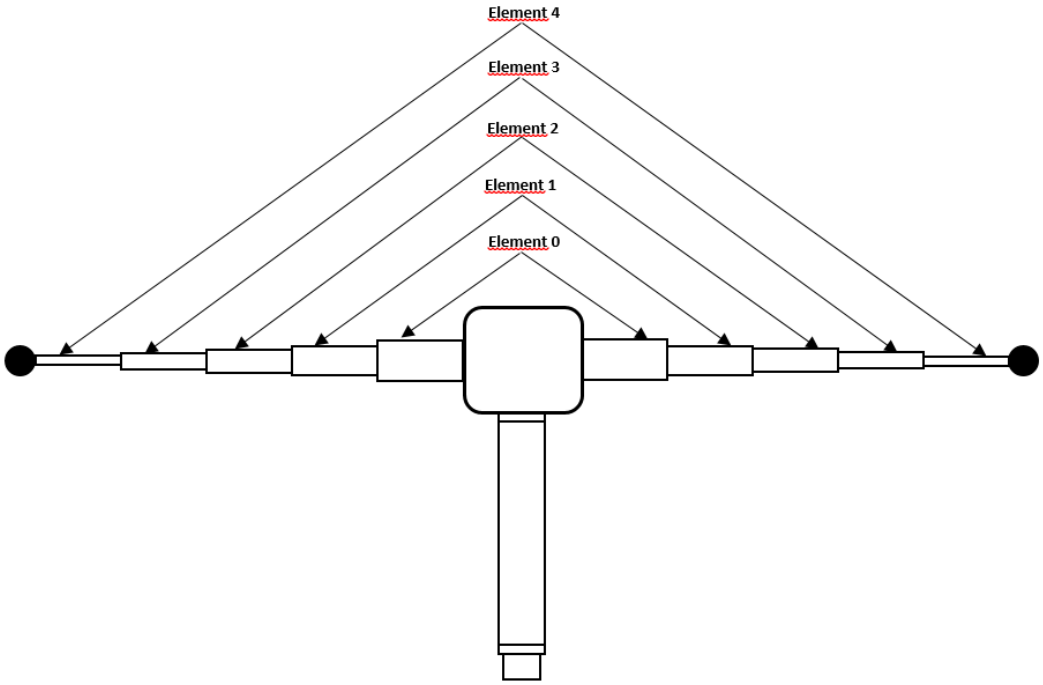
Tripode Mod.TR-02-A

Dipole Mod. D-1 Loop

Leak Mod. L-3

Picture n°02

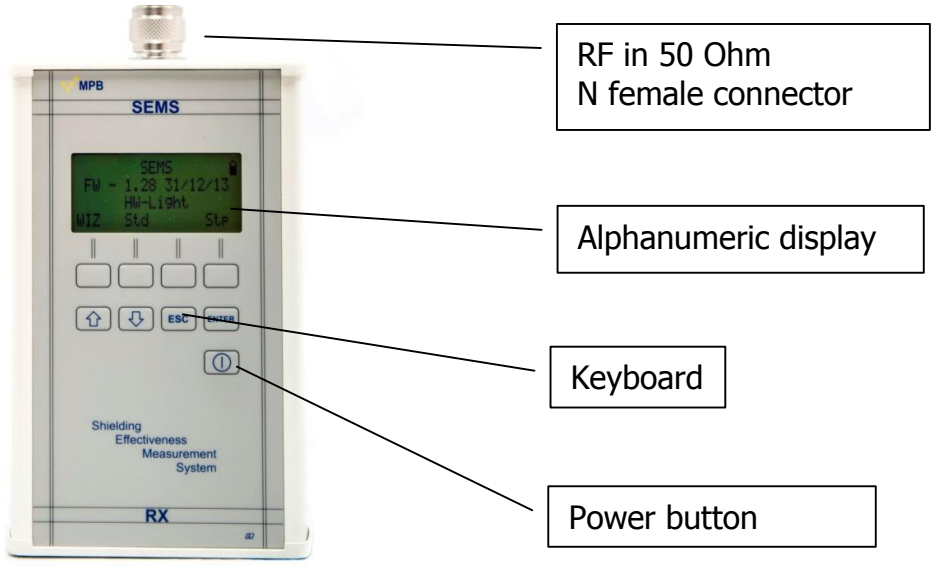
TIPS TO HAVE THE BEST DYNAMIC WITH DIPOLE ANTENNA MODEL D1



Frequency range [MHz]	Extended element
200-300	0
140-240	0+1
90-180	0+1+2
70-140	0+1+2+3
40-120	0+1+2+3+4

1.4. Receiver front panel

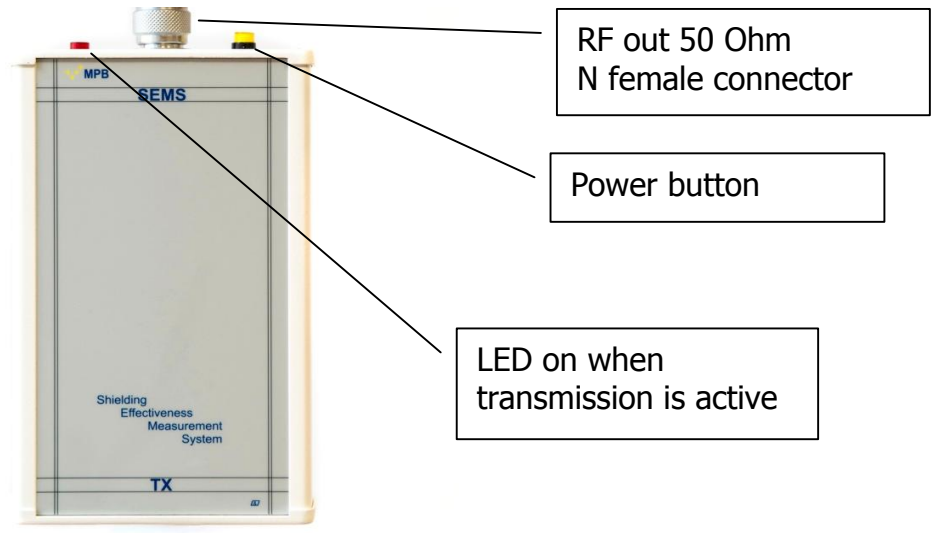
In the Picture below(n°03) is represented SEMS receiver front panel. It has a display and a command keyboard.



Picture n°03

1.5. Transmitter front panel

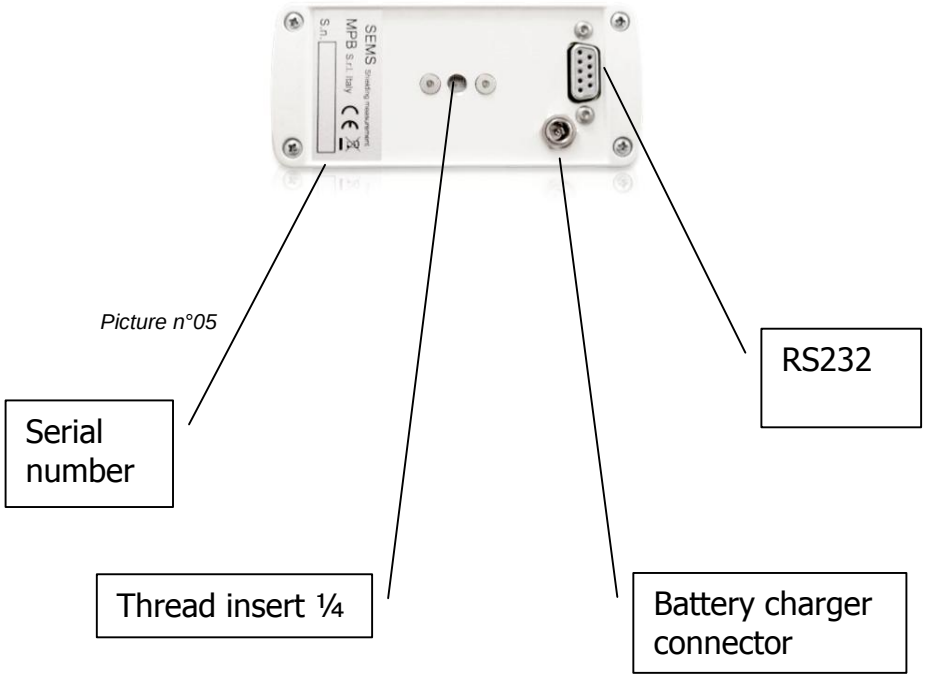
The SEMS transmitter (Picture n° 04) has no command button but only a power button and a led to indicate that the transmission is active, since the commands are sent by the receiver using the wireless connection.



Picture n°04

1.6. Receiver / Transmitter rear panel

The rear panels (Picture n° 05) are the same for both devices and upon them is possible to find the serial number, the thread used for the tripod, the battery charger connector and the RS232 interface for the wireless link.



Picture n°05

Important note: Always use the battery charger provided with the instrument to avoid serious damages to the devices and operator's injuries.

Important note: The battery charger must be connected to both devices (Tx and Rx) turned off.

1.7. Technical specifications

Frequency range for TX/RX Resolution	10 kHz…300 MHz (SEMS Light up to 96 MHz) 10 Hz
RF out (TX module) Max output power (typical)	Z_{out} 50 Ω, N fem. +30 dBm
RF in (RX module) VSWR Attenuator Max input power Dynamic Range	Z_{in} 50 Ω, N fem. < 1.2 0…20dB 110 dBuV 120 dB
IF bandwidth (RX module)3 dB bandwidth	5/150Hz
Attenuation measurement accuracy (typical)	10 kHz…30 MHz ± 1.0 dB 30 MHz…300 MHz ± 1,5 dB
I/O interface	RS232 / Wireless
Buzzer	To set on attenuation level
International standard compliance	MIL-Std-285 IEEE Std 299 EN 50147-1 NSA65-6
Operating temperature	0°….40°C
Battery	Irreplaceable and rechargeable Li-Ion (6 h operating time)
Antennas Loop Mod.L-1 Loop Mod.L-2 Rood Mod. R-1 Dipole Mod. D-1 Loop Mod. L-3 Biconical Mod. B1	 Frequency range 2…128 MHz Diameter 30 cm Frequency range 10 kHz…4 MHz Diameter 30 cm Frequency range 1…60 MHz Adjustables on lenght Frequency range 40…300 MHz Adjustable on extension Used for RF Leak Frequency range 60…300 MHz Width 35 cm
Accessories **Wooden Tripode Mod. TR-02-A** **Optical Link Mod. LO**	 Adjustable in high With 20 m. fiber
Calibration Set-Up and Measurement	Programmable with the software
Weight and dimensions Overall weight Case dimensions	 9,4 kg 52x43x23cm

Technical specifications may change without notice

1.8. Battery recharge

To recharge the equipments is necessary disconnect the RS232 wireless and also the RS232 cable.

In sequence connect:

a) The battery charger to the main power supply until the green Led
b) Put the Jack plug in the SEMS units.

When the red light is on the charge is in progress.
At the end of the recharge the LED is green.
When the battery are totally empty, the recharging time is approx of 4 hours.

Be careful: The recharging time of each power supply is different because the electronic control of the tolerance about the total charge may be different

This mean that the status time of the LED (from red to green) may be different.

2. Operating principle

2.1. SEMS Receiver

The block diagram (a) below represents the SEMS receiver.

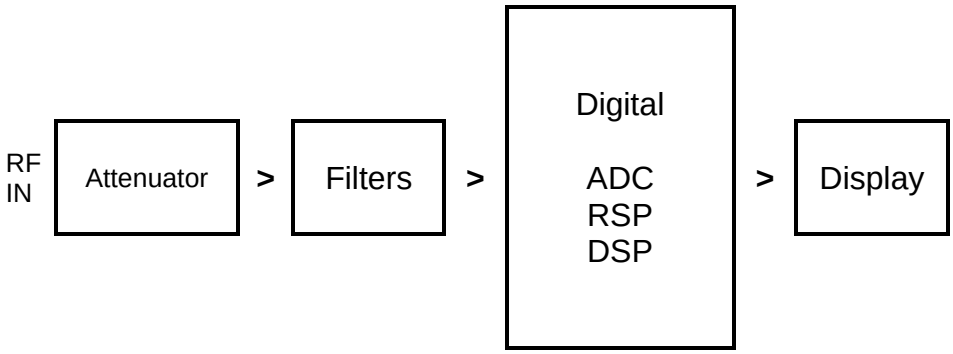


Figure a)

First of all the RF signal received by the antenna is attenuated by the attenuator module to fit the level to the next modules specifications, subsequently we can find the filters to select the bandwidth depending on the frequency settings. Then the RF signal is converted by an ADC and is processed by the digital part with a RSP and a DSP, the result will be shown on the display.

2.2. SEMS Transmitter

The block diagram below (b) represents the SEMS transmitter.

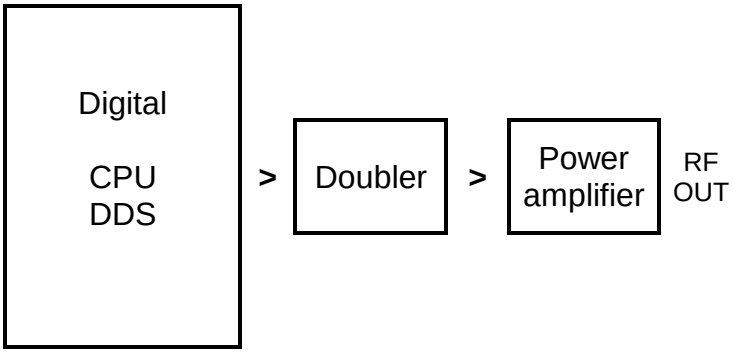
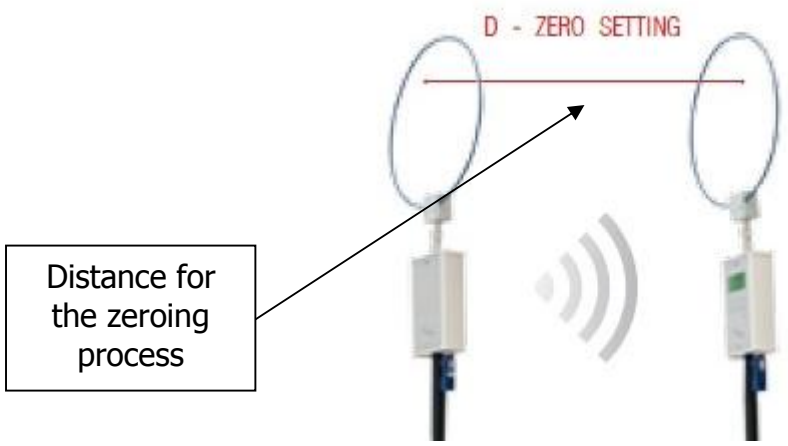


Figure b)

The transmitting signal is generated using the DDS controlled by the CPU that receives the instructions from the receiver wireless interface, this signal is duplicated and amplified in order to achieve the necessary level to be transmitted by the transmitting antenna.

2.3. SEMS System

The main purpose of the SEMS is to measure the shielding effectiveness in a shielded environment by measuring the attenuation of the electric or magnetic field.
The SEMS makes an a relative measure and not absolute
We can briefly describe the operating principle as it follows:
The transmitter generates a RF signal and irradiates it through the antenna, at a certain distance the receiver catches the signal with an equal antenna and measures the signal level. If we move the receiver inside the shielded environment maintaining the same distance from the transmitter we will get a lower signal, so we can consider the shielding attenuation the difference between the reduced and the original signal.



Picture n°06

Example of zeroing with loop antennas

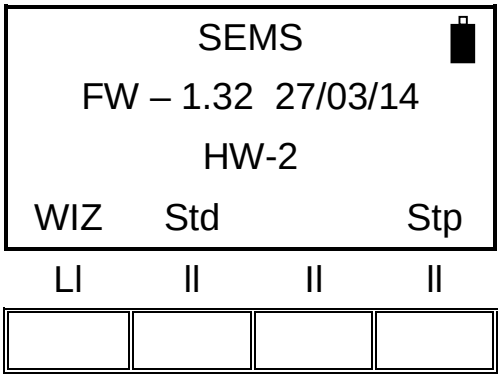
2.4. Power saving and recalibration

The SEMS has an integrated timer in both RX and TX unit for two different reasons: the TX automatically turns off after 17 min of idle to save the battery; the RX unit after 15 min from the last zero setting suggests to recalibrate the SEMS by repeating the procedure.

3. System use and operations

3.1. Turn on menu

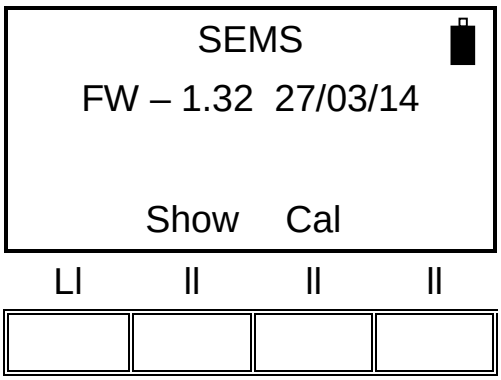
By pressing the power button of the RX module the device will turn on, to turn it off press the power button for at least 4 seconds. Follow the same procedure for the TX module.
As soon as the device is turned on, the display will show the following screenshot.
On the top right of the screen will appear a battery icon to show the charge status of the RX module, then the TX connection on the top left will appear the TX device battery icon.
"I*f the battery icon do not appear on the top left, there isn't communication from the units. Please check the configuration of the wireless Bluetooth" (Ind 3.5-page 32)*



NOTE: As soon as the connection is established, if the red led of the wireless devices blinks together with the yellow ones, wait until the complete switching off of the first ones in order to let the devices synchronize and ensure the correct functioning.

3.2. Std Menu

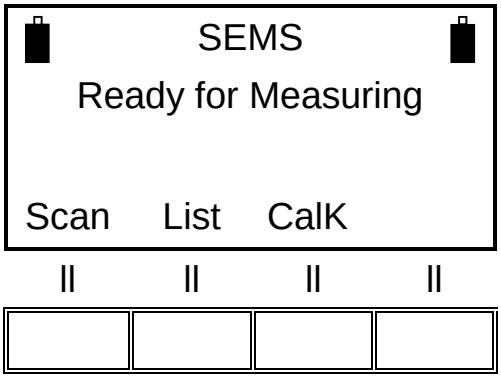
By pressing the Std menu button this screenshot will appear



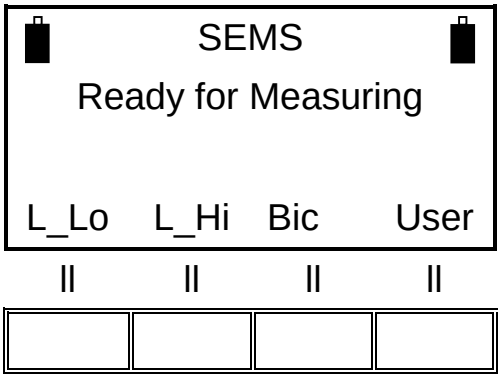
Then pressing the relative button allows the access to **Show** and **Cal** menu.

3.2.1. Cal Menu

Cal menu is used to perform the system zeroing process(Scan or List) or the system calibration process(CalK)

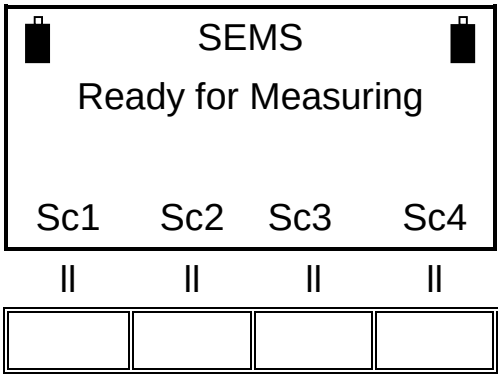


Scan performs the system zeroing process using the standard or customized frequency bands, by pressing the scan button we will see the following screenshot where is possible to choose the default bands (**L_Lo**, **L_Hi** e **Bic**) or the user's customized bands (**Sc1**,**Sc2**,**Sc3** and **Sc4**)pressing the **User** button (customized bands are programmed with the "SEMS PC_Utility" software)

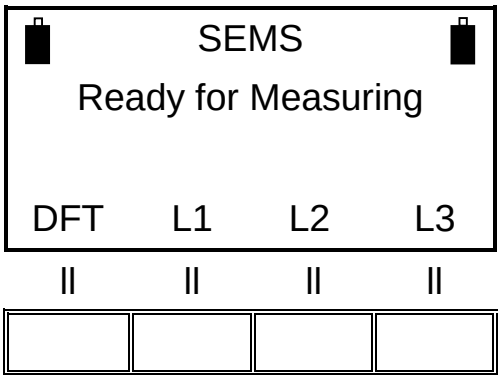


The choice of the button to press depends on the different types of antennas:
L_Lo (Loop antennas Mod. L2)
L_Hi (Loop antennas Mod. L1)
Bic (Biconical antennas Mod. B1)

By pressing the **User** button will appear the screenshot to choose the memorized band:



List performs the system zeroing process using the default or programmable frequency list, by pressing the list button will appear a new menu where you can select the default frequency list **DFT** or three programmable lists (**L1, L2** e **L3**)



CalK performs the system calibration process using the four 30 dB attenuators (optional accessories CAL-KIT).

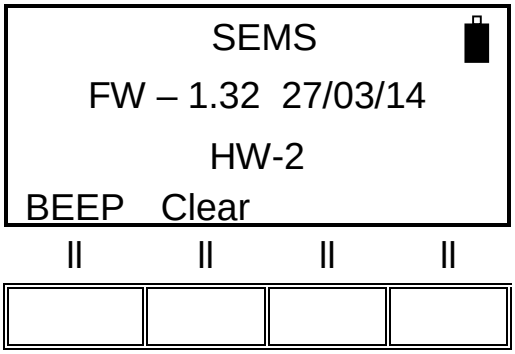
NOTE: This procedure needs a wireless connection between TX and RX, you can control the connection with the battery status on the left top of the screen of RX (will be visible only if the connection has been successful).

Note: Never use the CalKit procedure with the charger connected

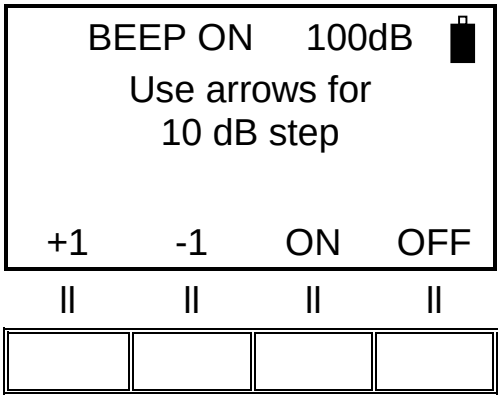
When the zeroing procedure ends the following menu will appear:

3.2.2. HiDyn is a special function available only for a number max of 30 frequencies With this mode the operator, during the zero step, is be able to understand if there is some noise (radio frequency disturbance) at the same frequencies of the test, that could compromise the dynamic of the measure

It's possible make a scanning in automatic or manual mode just press the Stp menu like show below:



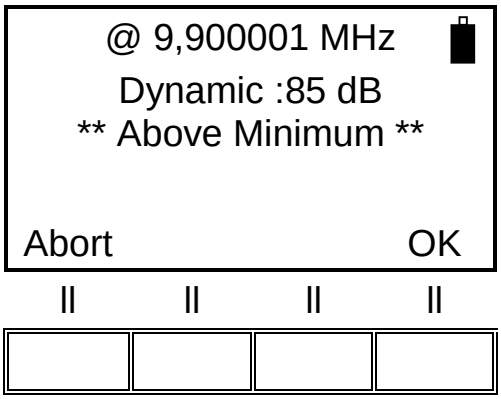
And after the Beep button



BEEP ON/OFF enables or disables the manual or automatic execution of the HiDyn Function

With the arrows is possible to set the threshold of the dynamics during the test

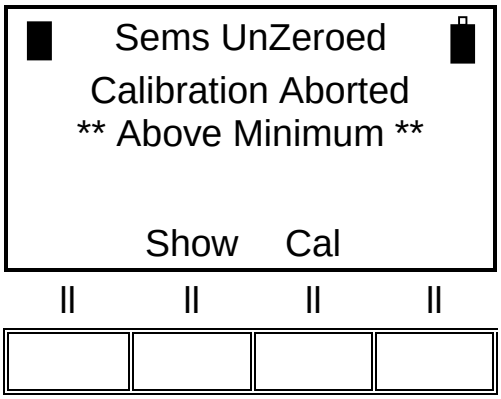
If for example,before zero procedure we set this value at 100 dB (with Beep "ON") the operator will know immediately if this threshold of dynamic will be available for the measure



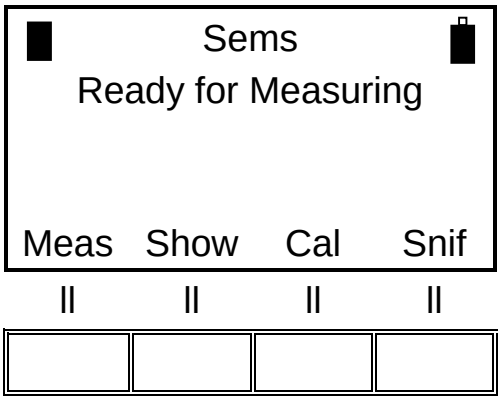
In this example the operator will know immediately how much dynamic will be available during the measure at the frequency of 9,900001 MHz.
Confirming with "OK" the SEMS Receiver will proceed at the next frequency through the activation of the "Best Dynamic" function like below:

For every frequency present in the table two additional side frequencies are added: the lower is f*0.99 (-1%) and the higher is f*1.01 (+1%)
All the frequencies are then tuned on RX unit, while the TX unit is kept OFF, and for each the noise floor is recorded.
At the end of this step, for each triplet the frequency point which shows lower noise floor is taken while the remaining two are discarded. In this way now a new table, same in number of point as the original one, is created.

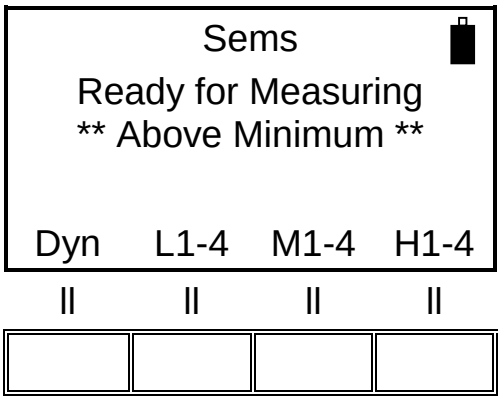
You can at anytime stop the "Best Dynamic" function
Pressing the "Abort" button will show the menu below



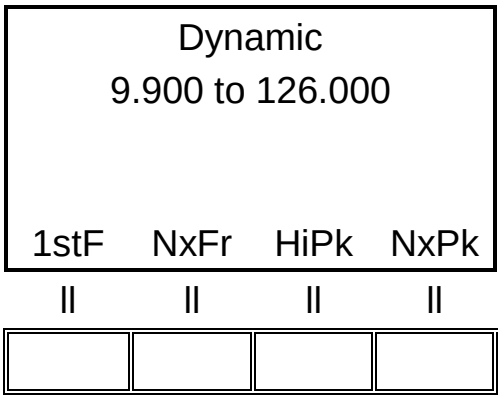
Anyway, you can view all the values of dynamic available for each frequency point with the command "Show", before to start the measuring:



And after "Dyn"



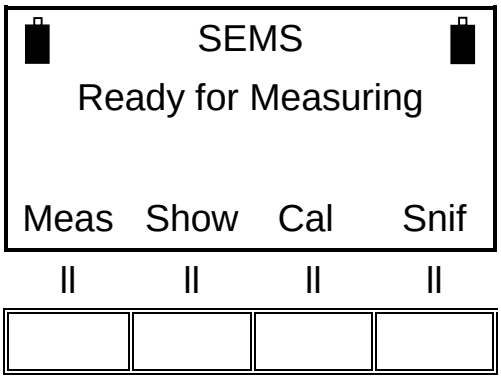
To view them one by one press the button NxFr (Next frequency) or HiPk (highest Peak) and NxPk (next Peak than the one displayed)



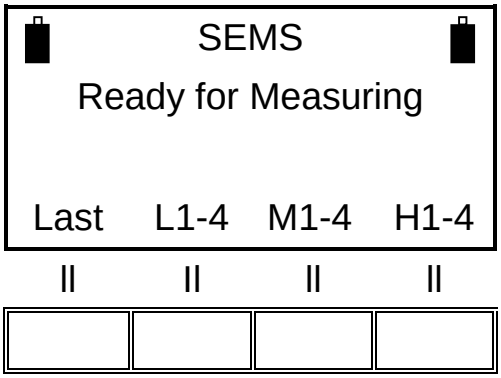
3.2.3. Show menu

The show menu will provide the results of the measurements performed and previously stored

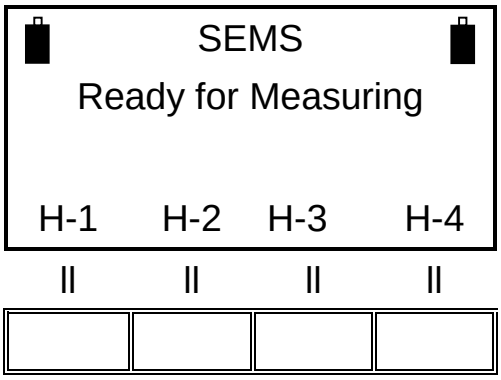
To see the saved measurements press the Show button



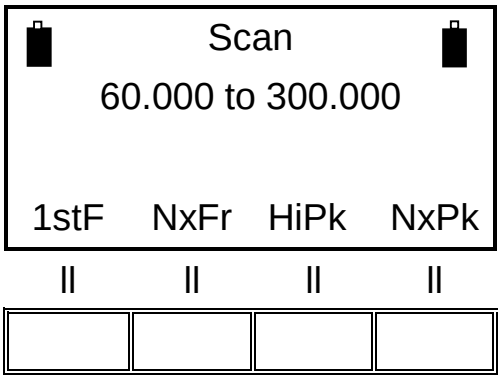
e.g. We will choose a measure stored in a memory named H1-4



Then we recall the H1 memory



1stF Shows the attenuation at the lower frequency of the selected scan or list
NxFr Shows the attenuation on the next frequency
HiPk Shows the minimum attenuation on the whole scan or list
NxPk Shows the first relative minimum of attenuation from the current frequency

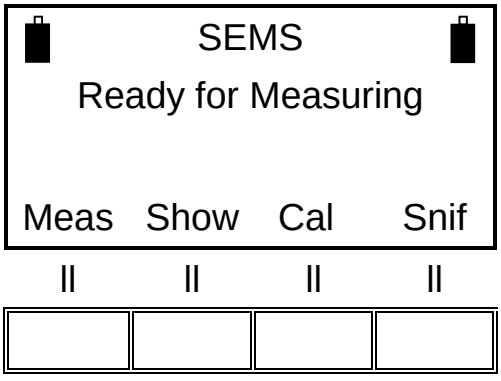


By pressing the **Last** button you will see the results of the last measurement performed, by pressing the remaining three buttons you can see the other stored data. (up to 4 for each button).
As soon as you choose the measure to see you can analyze frequency by frequency the measured attenuation.(The frequencies are always expressed in MHz)

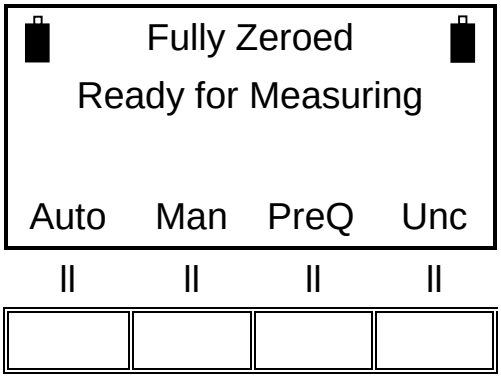
By pressing the **ESC** button you can go back to the previous menu.

3.2.4. Meas menu

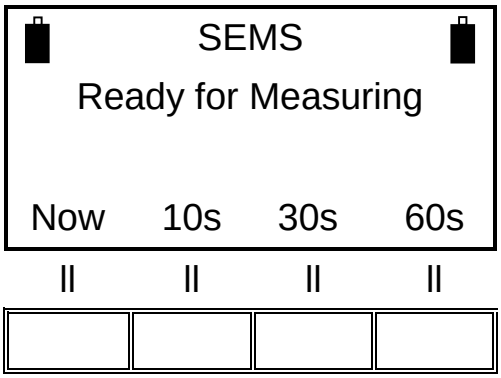
You can find the **Meas** command in the **Std** menu, but it will appear only when the system is zeroed using the **Cal** command described in the previous paragraph (3.2.1. of this manual).



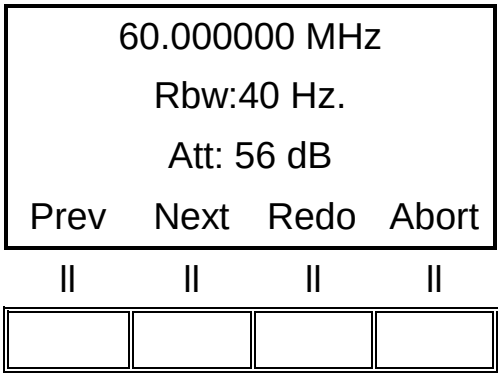
The command will perform a measurement of attenuation automatically (**Auto**), or manually (**Man**).



Using the automatic mode you can choose if you want the measurement procedure to start immediately (**Now**), or with a fixed time delay (**10s, 30s, e 60s**).



If you use a manual measurement you will use the commands: (**Prev**) measure of the previous frequency, (**Next**) measure of the next frequency, (**Redo**) in order to measure the current frequency and (**Abort**) to end the measurement.To measure the electrical component we recommend to use Rod Antennas ,Mod. R-1, completely open or the Biconical antennas Mod. B-1 on RX and TX unit. For the magnetic field you can use the pairs of Loop Antennas L-1 or L-2.

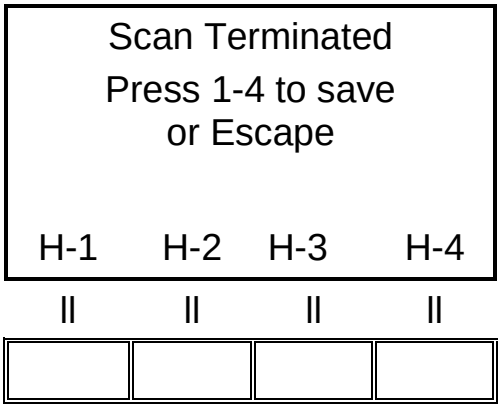


When the measurement is finished the display will show the memory slot to store the acquired data, you can choose one of the 4 memories for each frequency range:

Frequency Range from 0.01 to 2 MHz = memory (**L-1**, **L-2**, **L-3** e **L-4**)
Frequency Range from 2 to 60 MHz = memory (**M-1**, **M-2**, **M-3** e **M-4**)
Frequency Range from 60 to 300 MHz = memory (**H-1**, **H-2**, **H-3** e **H-4**)
It's possible to find some measure stored in a different slot because the last frequency of the list is on overlap with another

E.g. at 60 MHz you could have a slot of M or H

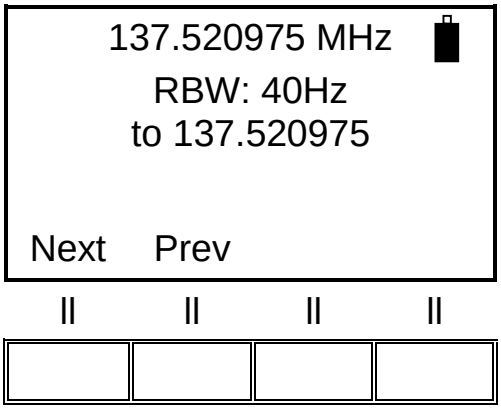
Example: Save request in the memory slots from 60…300 MHz range:



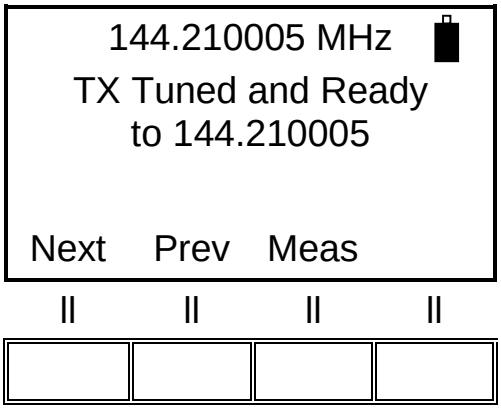
By pressing the H-1 button the data will be stored and you will go back to the starting screenshot.

3.2.5. Snif Menu

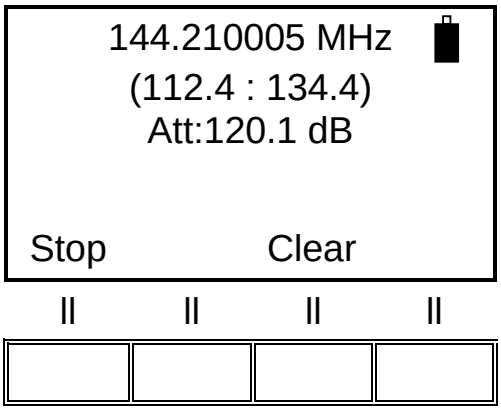
From this menu you can measure the shielding effectiveness on a single frequency for leak sniffing purposes.



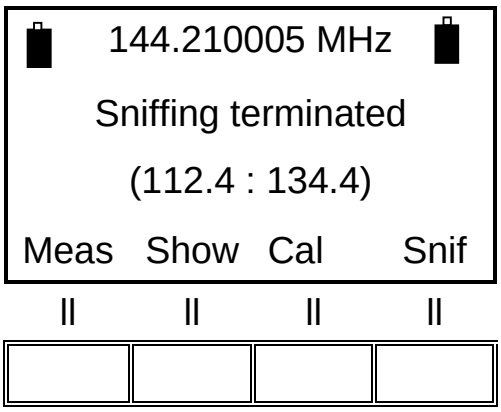
Press **Next** or **Prev** to select the desired working frequency for the sniffer



By pressing **Meas** the SEMS will start measuring the shielding effectiveness on the selected frequency, displaying the current attenuation, along with the maximum and minimum value in brackets.



By pressing **Clear** the maximum and minimum values are reset, and by pressing **Stop** you will halt the measure.



By pressing **Snif** again you can restart the sniffing sequence or select a different frequency.

Keep in mind that this operating mode can be successfully used in environments where both the RS232\Wireless Adapter is unusable, allowing, along with the Unconnected Mode (see the relative section in this manual), a full environmental investigation.

The devices need to communicate only during the selection of the frequency. As soon as the frequency is selected you will read the message "TX Tuned and Ready". From now on you can remove all the connections and start the measurement.
You'll need to restore the communication between TX and RX units only if you need to change the working frequency.

You can work with the sniffing mode with Loop Mod. L-3 antenna like in picture 7

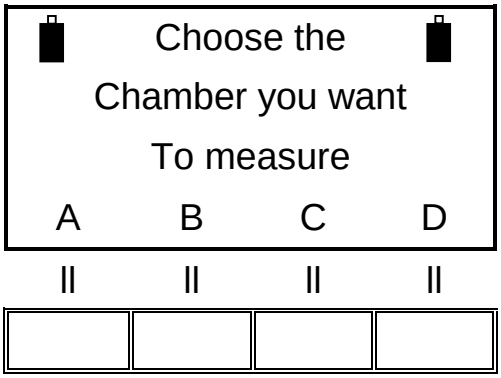
Picture 7

3.3. WIZ menu

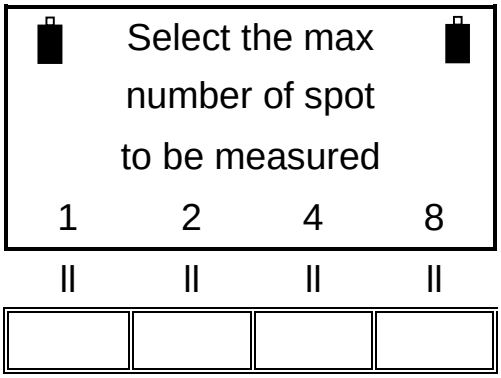
To improve the management of the measurement saving procedure you can use the SEMS's wizard for a better organization of data storage.

To use the wizard press the **WIZ** button in the top menu of the device. The wizard will lead the user throughout the procedure asking the following questions:

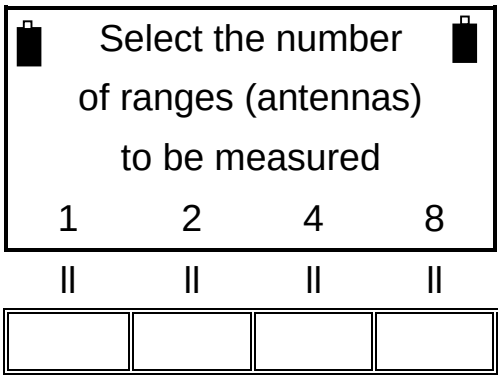
- The selection of the chamber where the measurements are performed (A, B, C, D): Using A, B, C e D you can identify a shielded chamber. Then the user has to remember the letter assigned to the chamber where the measurements were done.



- Choice of the maximum number of spot to be measured (1, 2, 4, 8): Represents the number of measuring spot assigned for each chamber. The user must sort chronologically the measured spot and he will find the same order in the instrument memory.

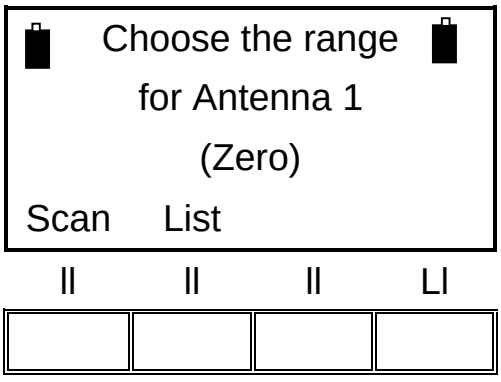


- The selection of ranges (antennas) to be measured (1, 2, 3, 4): it represents the number of antennas systems available to the user during the measurements. When you perform the measurements at all the points specified previously, the system will switch range, asking you to replace the antennas and redo the auto zero procedure.

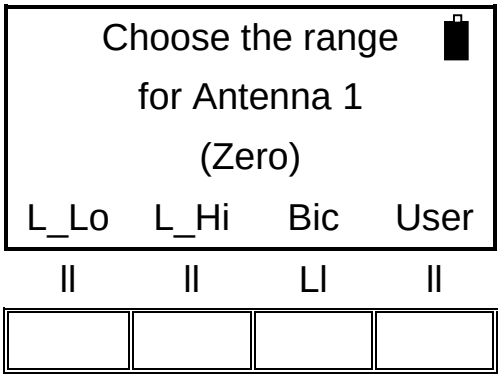


3.3.1. Measurement using wizard

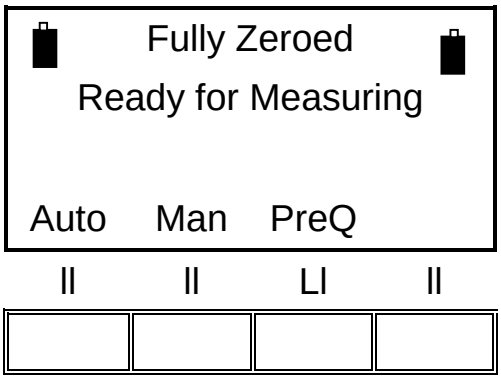
After the selection of the chamber, spots and ranges the instrument will start the procedure to perform the auto zero required by the first set of antennas to be used. The procedure to follow for this purpose is exactly the same of the auto zero calibration as described in chapter 3.2.1. of this manual.



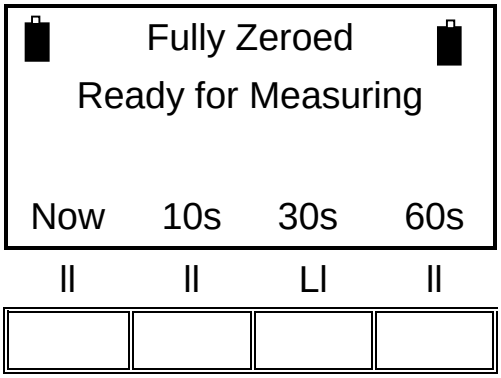
Selecting "Scan" we can choose to zeroing the system using the default mode (L_Lo - L_Hi - BIC) or to use the span programmable by the "SEMS PC_Utility" software mode (User).



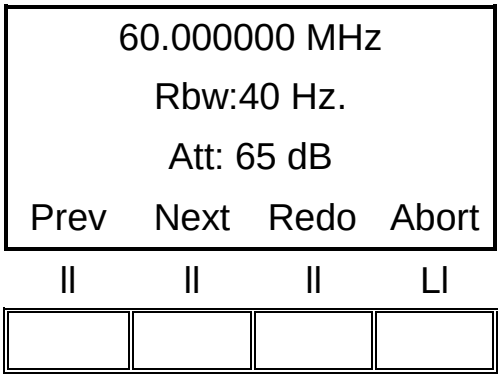
As soon as the zeroing procedure is completed, the measurement screenshot will appear on the display.
In this screenshot the user has to decide how to perform the measurements: automatically (**Auto**), or manually (**Man**).



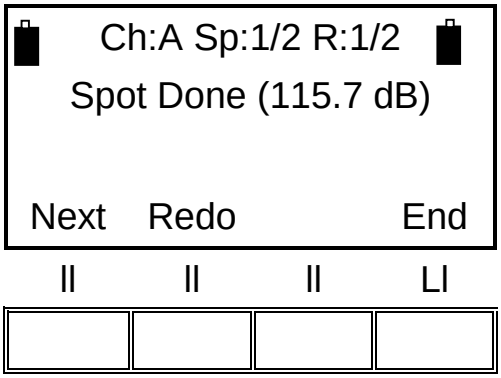
Choosing the automatic mode we can make it start immediately (**Now**), or set a fixed time countdown before starting (**10s, 30s, e 60s**).



When the manual mode is selected , the user has to choose the commands: (**Prev**) to measure the previous frequency, (**Next**) for the next frequency, (**Redo**) to repeat the measurement on the current frequency or (**Abort**) to quit.



After this choice the measurement will be performed, and will appear the wizard management screenshot to control the status of the procedure.



In this screenshot "Ch:A" means that the chosen chamber is called "A", "Sp:1/2" is the measurement spot index (in this case the spot is the 1st of the 2), "R:1/2" is the antennas system (range) that we are using (in this case we are using the first system of the 2).

"Spot Done" means that the measurement is completed for this spot with the indicated range, the value shown nearby beneath brackets is the maximum attenuation of the whole frequencies.

The **Next** button must be pressed to get to the next spot. If all the required spot have been measured, the procedure automatically switches to the next pair of antennas and shows again the auto zeroing screenshot. If you used all the antennas systems that you selected , the procedure is over and it will return to the main screenshot with a success message about the data storing.

The **Redo** button repeats the measurement for the selected spot shown in the screen, as soon as this operation is completed the display shows the same screenshot with the updated value of the maximum attenuation.

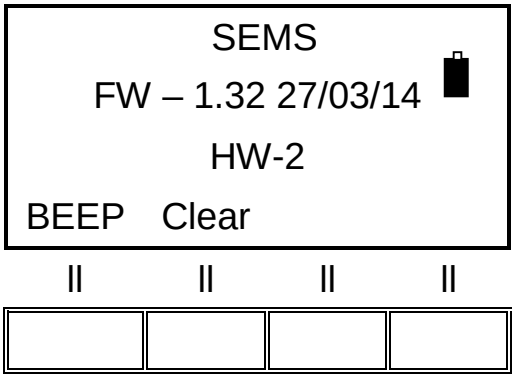
The **End** button stops the measurements with the current set of antennas. By pressing it the instrument will ask us to change the antennas and to start the auto zero procedure, if the antennas systems have all been selected the procedure will end with a message of success about the storing of the data and you will go back to the main screenshot.

WARNING: Pressing the "End" button in the first antennas system will reduce the spots for all the other systems. (e.g. if I select 8 spots and I measure just 3, pressing end will reduce to 3 the maximum number of spot per system. But if we perform a measurement on all of the 8 spots, then we will change antennas, and then again we will press the end button after just 3 spots measured and all the 5 spots will be kept.

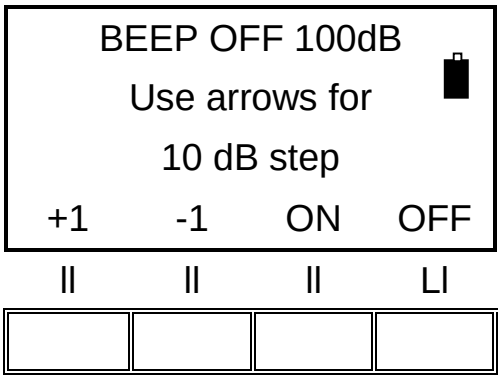
3.4. STP Menu

SEMS has an internal buzzer that beeps every time that a customizable alarm threshold is exceeded.

To activate this function you have to press the "Stp" button in the main screenshot shown as you turn the instrument on.



and BEEP button



Using the up and down arrows on the SEMS keyboard is possible to move the threshold to 10 dB, to set a more fine value is possible to press the **+1** and **-1** buttons to increase or decrease the threshold to 1 dB.

By pressing the **ON** button the buzzer will be activated, and during the measurements if the attenuation measured drops below the threshold the buzzer will produce an acoustic signal. **(Warning! This is a multifunction button. It's used also for the HiDyn Function)**

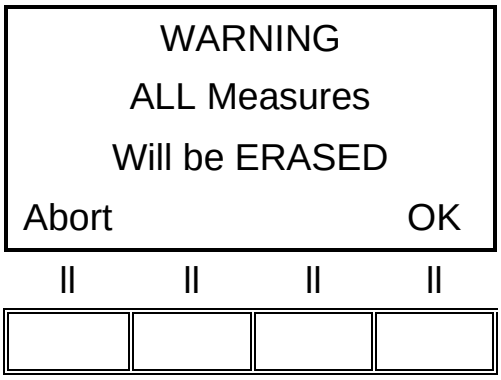
While the measured value remains under the threshold the buzzer will produce a fast series of beeps, when the measured value returns over the threshold the buzzer will be still beeping but with a slower series of sounds.
The **OFF** button will take the sound off.

The sound mode status is reported on the top of the display in this menu "BEEP ON" and "BEEP OFF".

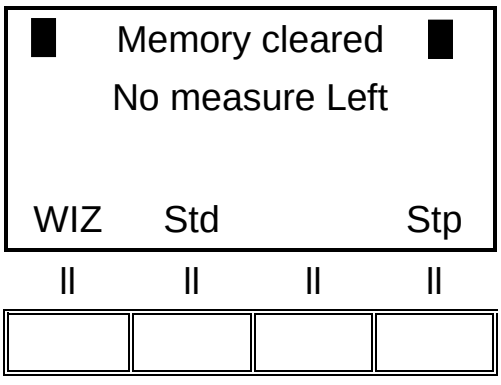
The actual threshold is written on the right top of the screen (in this example is 100 dB)

Clear

With this function you can delete all the measure stored inside the RX unit



Pressing OK



3.5. Measuring the shielding attenuation

1) Place the receiver and the transmitter on the non conductive tripods (height 120 cm), and place them at a distance of 40/60 cm if you are using the loop antennas and 100/200 cm if you are using biconical or dipole ones.

2) Connect the antennas upon the transmitter and receiver being careful to align them in a parallel way.

3) Connect the wireless transducers to the RS232 port on the transmitter and the receiver, turn on both devices and wait until the green blinking light stops and remains turned on and the two icons of the batteries become visible on the receiver's display. Is recommended to wait a few minutes before going on (warm-up).

4) Perform the zeroing procedure by using the **Cal** button, then select **Scan** or **List** for the desired frequencies.(other zeroing mode is available to improve the dynamic during measure. See Chapter HiDyn)

5) As soon as the zeroing procedure is over move the receiver into or out the shielded environment near the first measurement point and the transmitter in the opposite side trying to maintain the same distance used during the zeroing plus the shield tickness.

6) Measure the attenuation pressing the **Meas**, **Auto** and **10s** button to allow the user to walk away from the measuring system.

7) As the measure ends save the result in a memory.

8) Repeat the 5, 6 and 7 steps for each measurement spot.

9) After all the spots are measured download the results on a PC using SEMS PC Utility software provided with the product.

Configuration of the Key wireless Bluetooth

MASTER<<---- ON OFF ---->>

ON	4 - OFF=115K ON=9600
ON	3 - AUTO MASTER
ON	2 - AUTO DISCOVER
OFF	1 - FACTORY DEFAULTS

SLAVE <<---- ON OFF ---->>

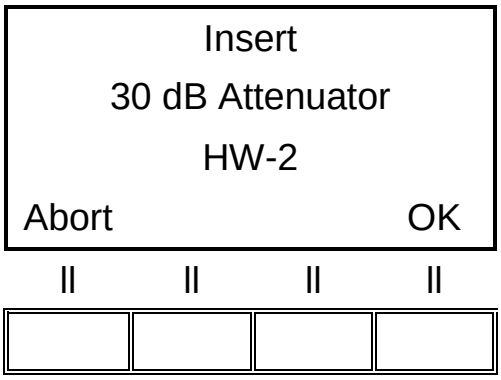
ON	4 - OFF=115K ON=9600
OFF	3 - AUTO MASTER
ON	2 - AUTO DISCOVER
OFF	1 - FACTORY DEFAULTS

3.6. Calibration using Calkit

The SEMS needs a periodic linear calibration, the Cal-Kit can easily and precisely accomplish this purpose. If required the Cal-Kit can be provided with Accredia calibration.

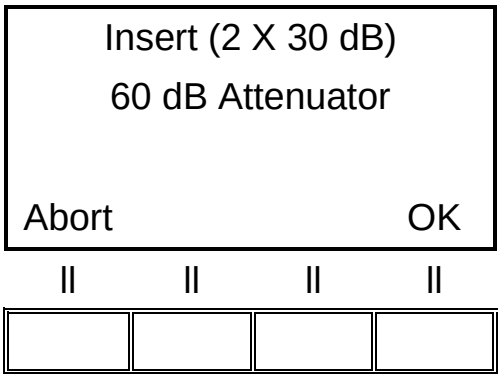
To start the calibration procedure press **Std/Cal** button from the main menu and press **CalK** button, then calibration can be performed following the instructions on the display.

This screenshot shows the request for the 30 dB attenuator



Connect the Tx and Rx using the 30 dB attenuator and press the OK button

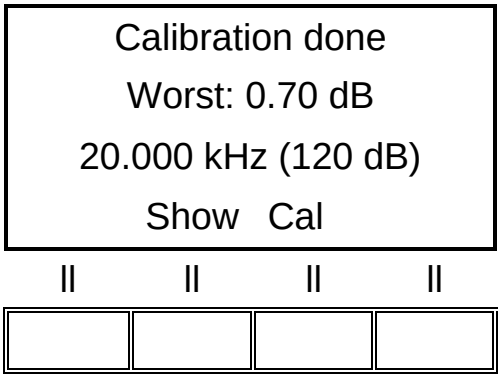
This screenshot shows the request for the second attenuator



Connect the second attenuator and then press the OK button

Repeat the same operation until you will use all the four 30 dB attenuators (4x30 dB= 120 dB)

When the calibration is done the following screenshot will be shown



The "Worst" parameter shows the worst accuracy over frequencies (in this case is 0.7 dB at 20.000kHz) typically is a parameter that you can find in the technical specifications of the chamber:

10 kHz... 30MHz ± 1.0dB
30 MHz...300MHz ± 1.5dB

The following image show the procedure set-up.

Picture n°08

3.7. Measurement with Rod antennas mod. R1

When using Rod antennas(in the zero setting and in the measurement phase) it's absolutely necessary to connect the SEMS TX 10 dB attenuator ,already supplied, before connecting the Rod antenna (picture n.09)

WARNING: not using the attenuator can cause serious troubles to the system functionality.

Picture n°09

3.9. Unconnected Mode

Some measurement applications are not suited for the usage of the RS232\Wireless Bluetooth key or the Optical Link Mod. LO.

An example could be a measurement in a shielded environment with no waveguides on technical panels

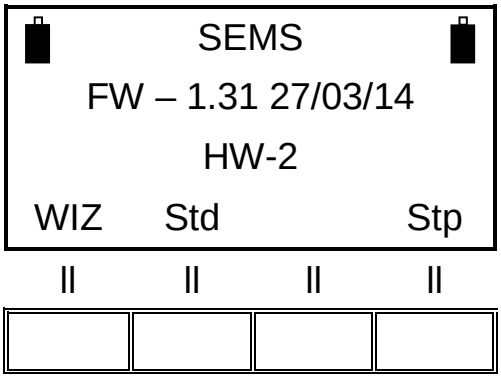
For those kind of applications there's a specific operating mode called Unconnected. In this operating mode, during the measurement, there's no need of a connection between the RX and TX unit.

To use this operating mode the SEMS RX must be programmed (through the SEMS Software) with a specific list of no more than 20 frequencies.

The list can be saved in any of the three L1-3 slots.

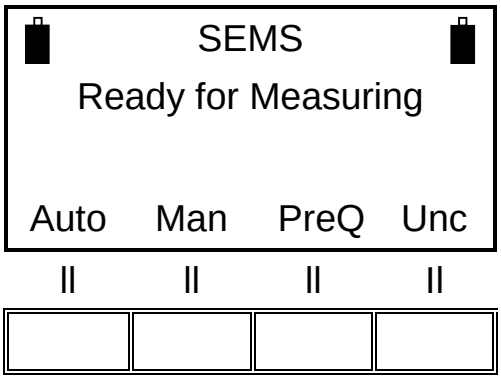
The Unconnected mode can be used either in the Wizard or in the Standard mode.

To use it in **Standard mode** select Std from the home menu:

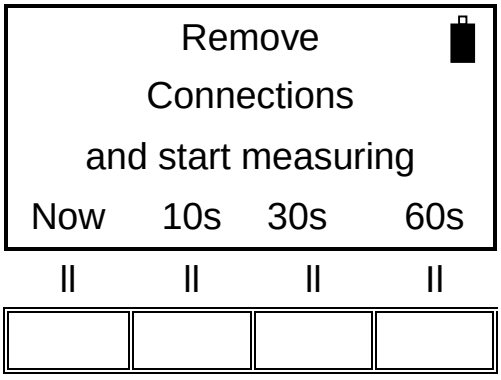


Press **Cal**, then **List** and then select the list where you saved the frequencies for the unconnected mode. Proceed with the zeroing sequence as you would do for a normal measurement.

As soon as the zeroing sequence ends press **Meas**:

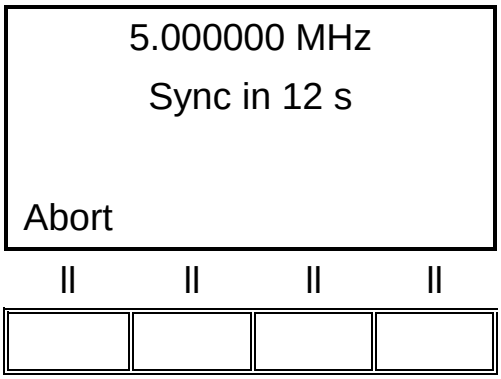


Place the TX and RX units in the desired measurement spot and press the **Unc** button to enable the two units to synchronize their internal clock.
Note that you have to make this step while the 2 batteries are visible on the LCD display

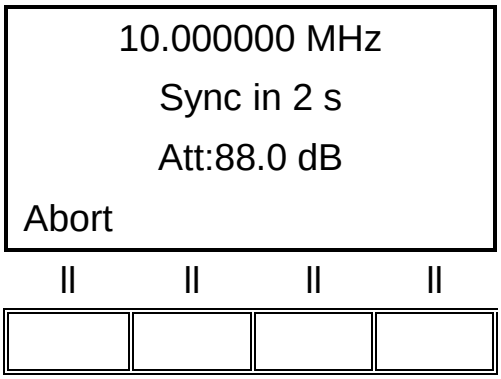


Now you can remove the RS232\Wireless adapter from the RX unit (you'll see the battery icon of the TX Unit that disappears), close the door of the shielded environment and start measuring.

You'll see a countdown starting from a value that can vary according to the moment in which you started the measurement and the number of frequencies you entered in the list.

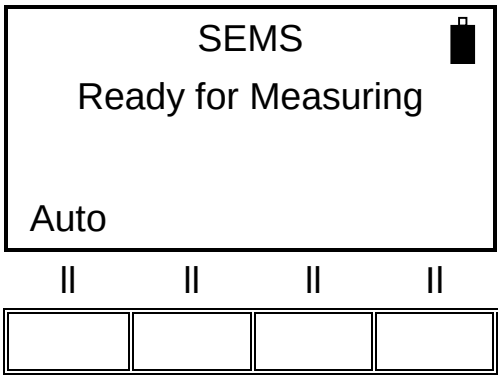


After the first measurement you'll see that before each frequency there is a synchronization delay.



As soon as the measurement ends you can save the data in a memory slot just like in a normal Standard measurement.

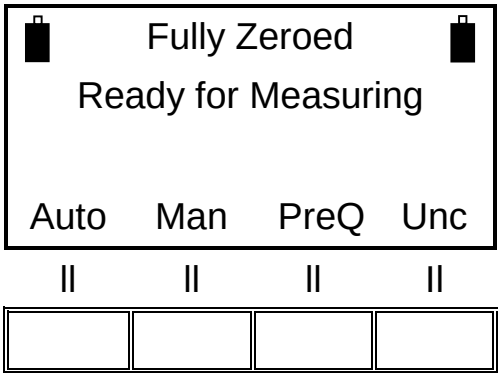
If you need, you can start another measurement by selecting **Meas** again:



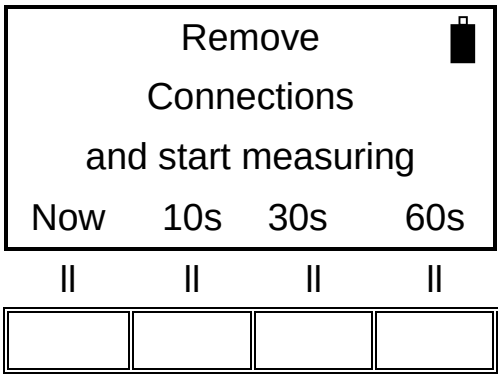
By pressing **Auto** you can begin a new measurement without reconnecting the two units. However, you can do this only for a fixed period of time (see below).

The usage of this mode in a **Wizard** measurement works in a very similar way.

You can start a wizard zeroing sequence by selecting the list you programmed for the unconnected mode as the only range.

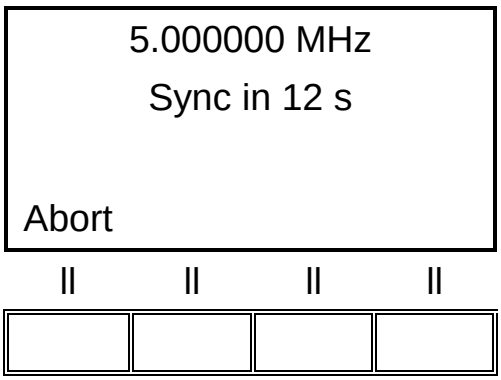


Place the TX and RX units in the desired measurement spots and press the **Unc** button to enable the two units to synchronize their internal clock.
Note that you have to make this step while the 2 batteries are visible on the LCD display

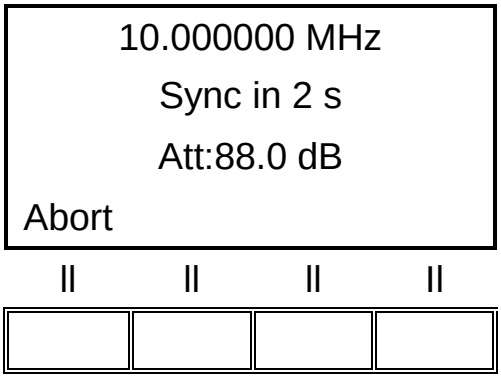


Now you can remove the RS232\Wireless adapter from the RX unit (you'll see the battery icon of the TX Unit that disappears), close the door of the shielded environment and start measuring.

You'll see a countdown starting from a value that can vary according to the moment in which you started the measurement and the number of frequencies you entered in the list.



After the first measurement you'll see that before each frequency there is a synchronization delay.



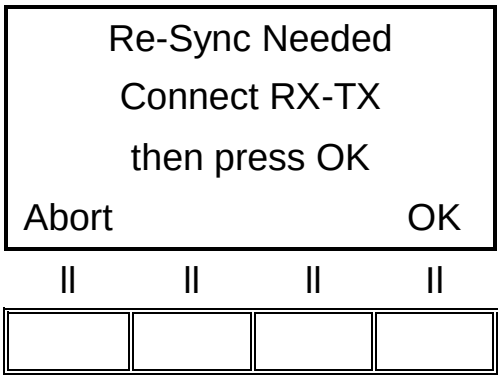
As soon as the measurement ends you'll see the usual "Spot Done" screen from Wizard mode, where you can repeat the measurement (**ReDo**) or start measuring the next (if there is one) spot (**Next**).

In both Standard and Wizard mode you have a limited time to make the measurements before reconnecting the RX and TX unit.

This time limit is used to avoid measurement errors imputable to long term clock delays.

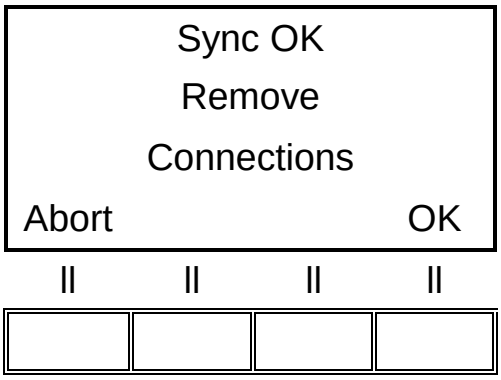
The timer starts from the moment in which you press the **Unc** button.

After 14 minutes, if you start a measurement, you will be prompted to reconnect the TX and RX unit to recalibrate the internal clocks.

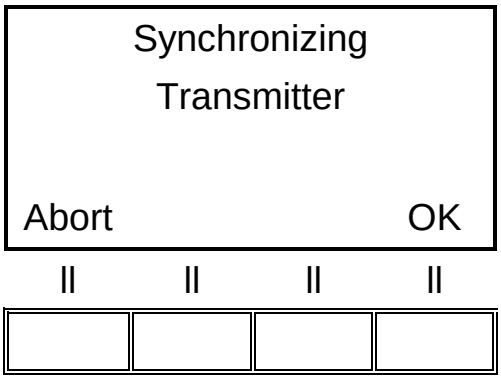


At this point you must reconnect the RS232\Wireless adapter, wait for the steady green light to appear and then press **OK**.

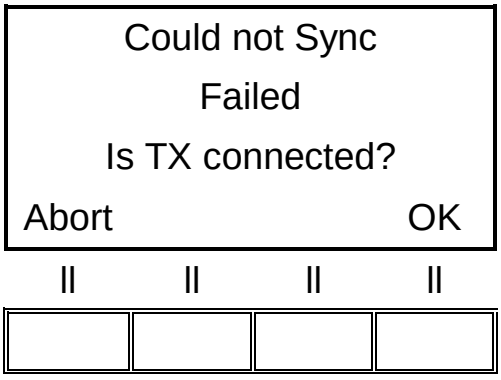
If the connection is successful you'll see the following screen:



Now you are able to start the measurement, the 14 minutes timer is restarted. If the connection fails (keep in mind that after 17 minutes the TX Unit turns off automatically) you will see the following screen:



And after pressing OK:



In this case, check the TX connection and if needed turn on the unit. Then, try again by pressing **OK**.

3.9. Prequiet Mode

Some shielded environments are naturally noisy. The background noise of the environment can affect the quality of the measurement itself.

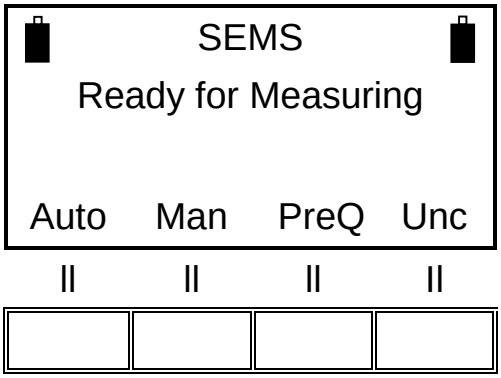
To avoid this the SEMS has a cleaning function called Prequiet Mode.

In the Prequiet Mode the SEMS RX modifies the working frequencies so that the environmental noise is kept out of the measurement points.

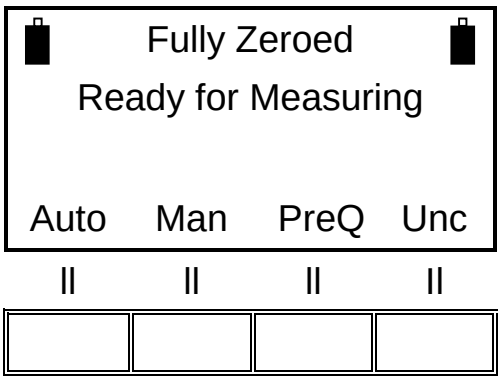
The Prequiet mode is available in both Wizard and Standard mode, but it can't be used together with Unconnected mode.

In both cases, you have to do the zeroing of the system , then, in the Meas menu, you'll find the **PreQ** button.

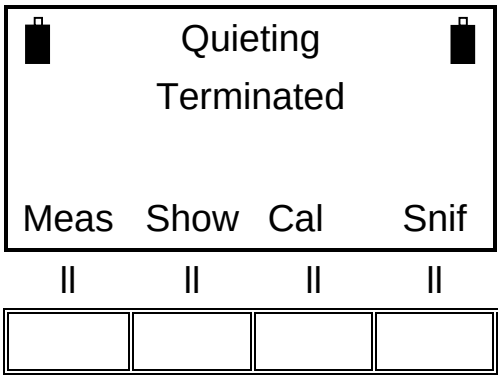
In Standard mode:



And in Wizard mode:



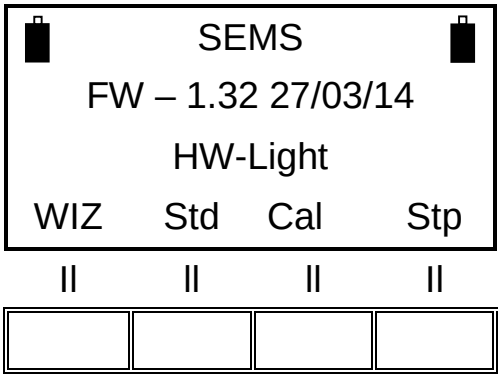
As soon as the quieting procedure finishes you can start the measurement.



By pressing **Meas** and starting a measure, the SEMS will automatically use the optimized frequency list.

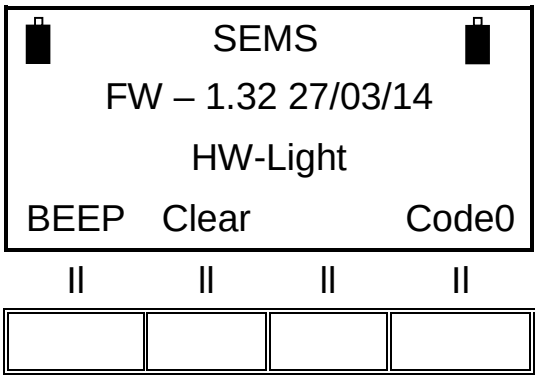
3.10. SEMS LIGHT

When you start on the RX unit the display will show

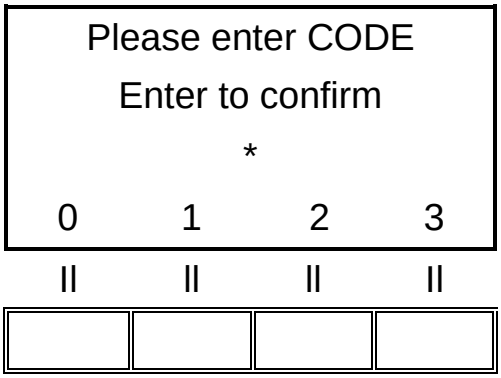


The SEMS LIGHT has the same functions and performances than SEMS.
The only limit is on the max frequency until 96 MHz

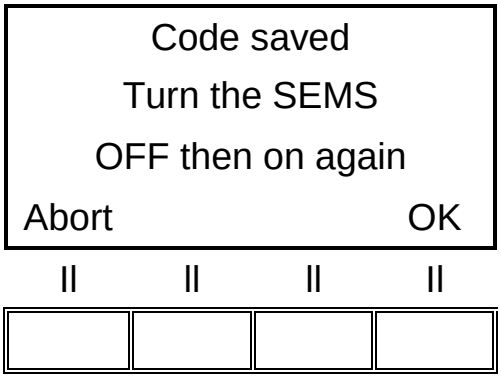
In the Stp menu it's possible upgrade the RX Unit (through the activating code) from SEMS LIGHT to SEMS,so you can working until 300 MHz.



Note: The activating Code is an option Mod. Key-300



After you unlock the SEMS LIGHT the display will show:



And then you will be ready to measure until 300 MHz.

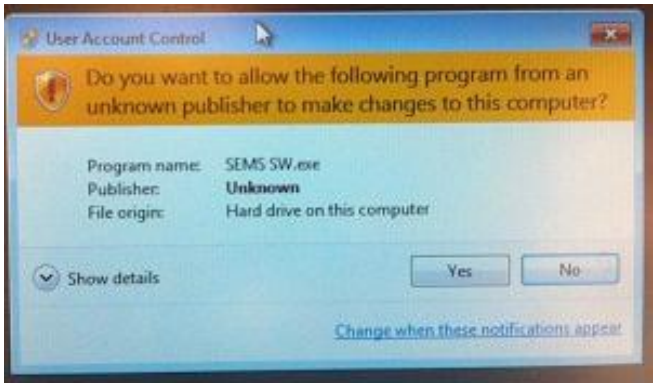
4. ***SEMS PC Utility*** software, controls and functions

4.1. Installation

4.2.

Insert the USB Drive that came along with your SEMS system into the PC you are installing the software to.

Launch the setup file (SEMS SW.exe) and click **YES** in the pop up window (Vista and Seven users only):


User Account Control
Do you want to allow the following program from an unknown publisher to make changes to this computer?
Program name: SEMS SW.exe
Publisher: Unknown
File origin: Hard drive on this computer
Show details
Yes
No
Change when these notifications appear

According to your computer settings, SEMS SW Installer will have on screen instruction in different language.

SEMS Software Installazione
MPB
Benvenuto
Benvenuto al programma di installazione di SEMS Software 1.22.
E' vivamente consigliato uscire da tutti i programmi Windows prima di continuare con questa installazione.
Se ci sono altri programmi in esecuzione, prego premere Annulla e chiudere questi programmi prima di rilanciare l'installazione.
Altrimenti premere Avanti per continuare.
< Indietro
Avanti >
Annulla

Follow the instructions on screen to complete the installation.
Be carefull: For the OS Windows 7 and upper you must launch the SEMS SW with all administrator permission.

4.2. Connecting the instrument

1) Plug the USB to Serial adapter to your computer.
2) Under Windows Seven, press Start, go in Control Panel, then Hardware and Sound, then Device Manager.
3) Under Windows XP press Start, go in Control Panel, then System, then Hardware, then Device Manager.
4) Take note of the COM port where the USB to Serial interface is mapped (I.E. COM3):

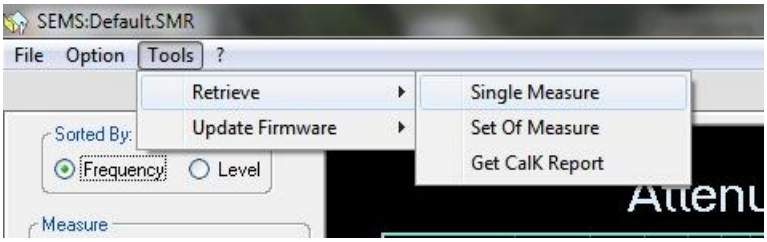
5) Connect the SEMS RX to the RS232 connector and turn on the unit.
6) Start the SEMS SW from the desktop shortcut or your start menu.
7) Open the "Option" menu, click on "Select Comm" and in the new window insert the number you've taken note before. Press the Enter key on your keyboard to confirm.

The program should be now correctly configured to communicate with the SEMS RX unit.

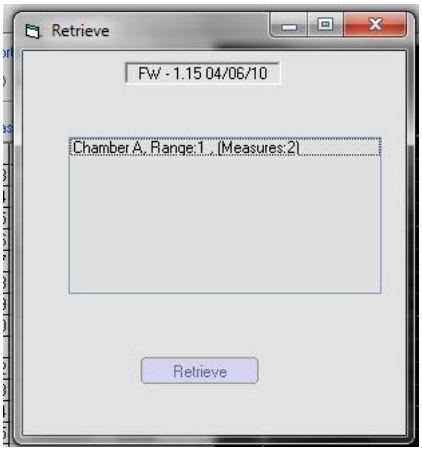
Note: Please use the driver version that comes with the SEMS for the USB to Serial interface.

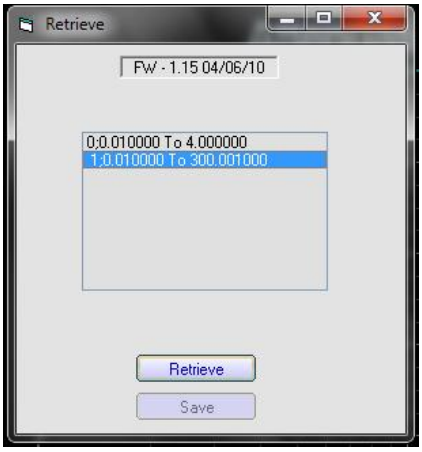
4.3. Retrieving a measurement

Through the Tools menu you can access different functions to query the RX unit.



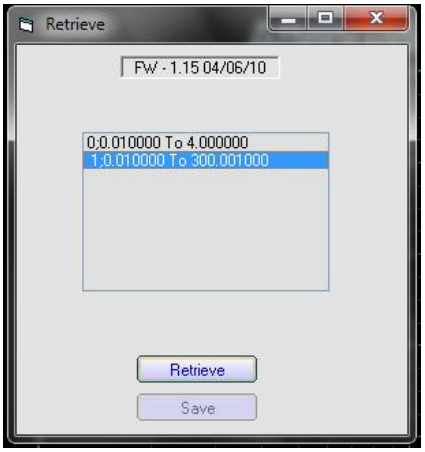
- **Single Measure** will download a single measurement previously stored in the SEMS memory.
- **Set of Measure** will download data relative to a specific room data set.
- **Get CalK Report** will download data relative to the calibration procedure (a TXT file with the report will be created).

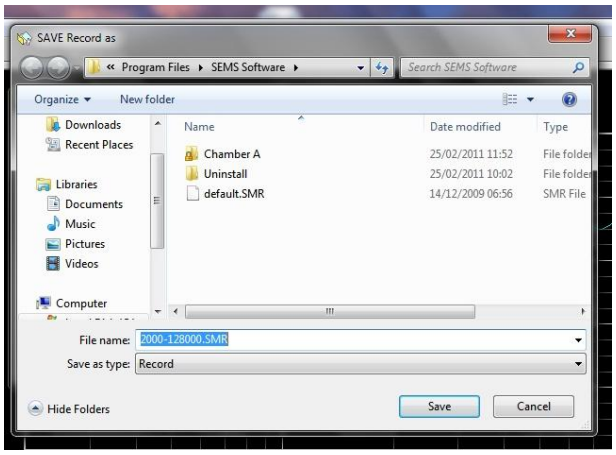




By clicking on the desired element and then pressing Retrieve data will be downloaded from the SEMS internal memory and shown on the main window (you will be asked to save an optional record file for latter reference)

To retrieve a single measure access the option from the relative menu (**Tools -> Retrieve -> Single Measure**) and select the desired measure from the popup window:



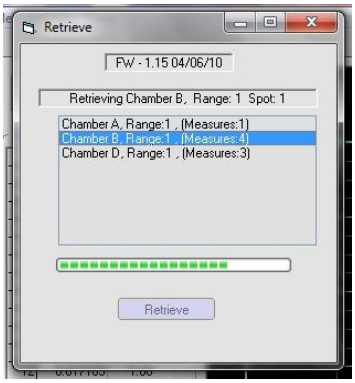


Clicking retrieve will update data currently shown on the screen with the retrieved measure and allows you to save the measure as a record file (SMR).
To correlate the memory slot to the index of the measure, you can refer to the following table.

Memory Slot	Index
L1	0
L2	1
L3	2
L4	3
M1	8
M2	9
M3	10
M4	11
H1	16
H2	17
H3	18
H4	19

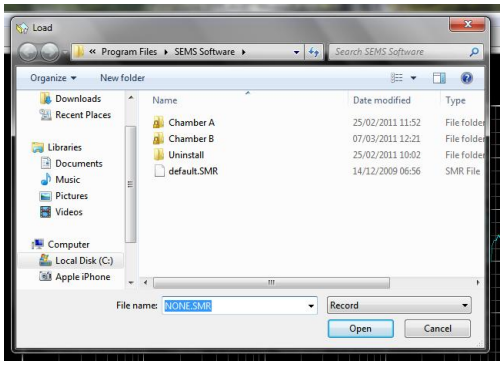
To consult this measure again, just use the **Load** button from the **File** menu and select the relative record file.

Retrieving a set of measures works in a similar fashion.
To retrieve all data relative to a chamber you have to click on **Retrieve -> Set of Measure** from the **Tools** menu, then select the dataset from the pop up window.

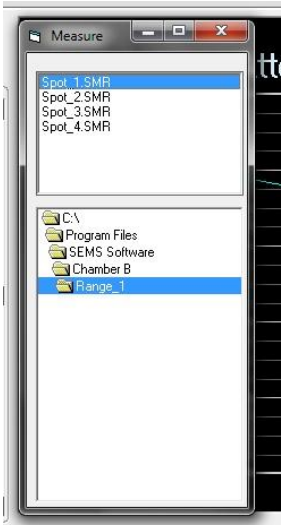

Retrieve
FW - 1.15 04/06/10
Retrieving Chamber B, Range: 1 Spot: 1
Chamber A, Range:1 , (Measures:1)
Chamber B, Range:1 , (Measures:4)
Chamber D, Range:1 , (Measures:3)
Retrieve

In this example, we are retrieving data from Chamber B, Range 1.
As you can see the window is showing the number of measures relative to each set (in this case, 4 different spots)

As the download finishes you are not prompted to save your data: this is because SEMS automatically saves sets of measures inside its own work folder.
To consult all data inherent to the chamber, just click **File -> Load**



Inside "Chamber B" folder you will find, organized in subfolders relative to the antenna (Range) used, all the measurement spots.
By selecting one of the SMR files the main window updates data with the one relative to the spot selected.
In addition, a new window appears to allow easy navigation between the measurement spots:

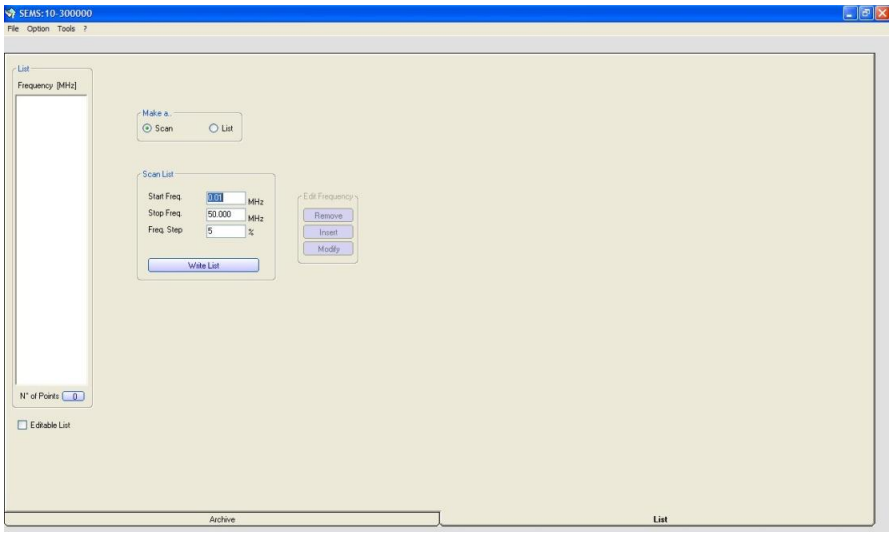


In the lower part of this window you can navigate through the work folder and select the desired chamber\range, in the top part of the window the measurement spots contained in the relative folder are shown.
You can select one of these spot and update the data shown on the main window by single-clicking it.

4.4. Programming a frequencies list with List or Scan

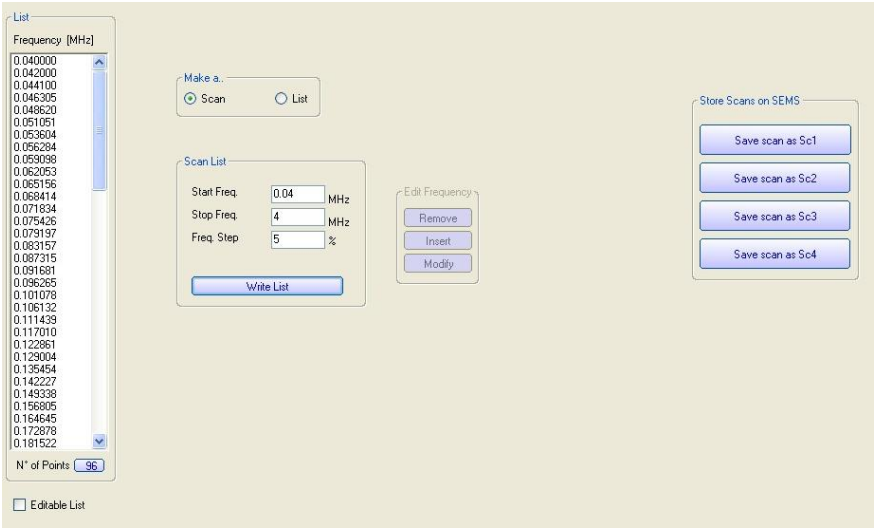
In the menu List, of the SEMS PC Software, it's possible programming a list of frequencies or a scanning and store them inside RX unit:

The picture below is the menu for programming



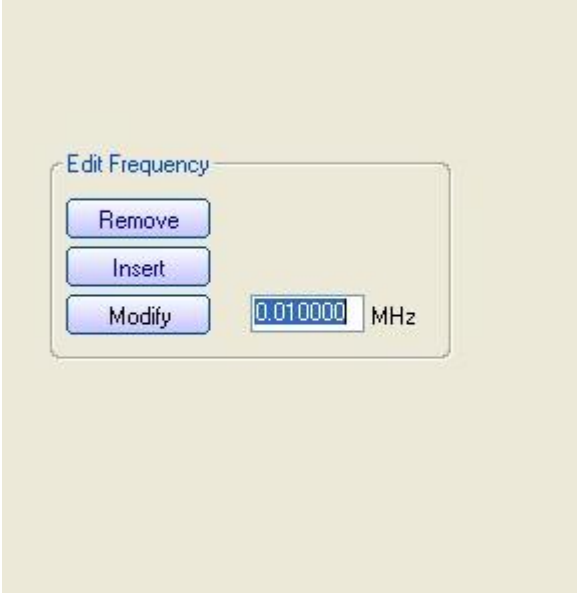
If you want use the Scanning you must select the start/stop frequency and choose the step in percentage

To make a table list, you must click on the "Write List" button



And then store it inside the RX Unit, clicking on one of the four available memories

Otherwise, if you want to make a frequencies list, just click in the "List" and edit the frequency



To make a frequencies List, you must select the "Insert" button, write the frequency value in the near area and push again the "insert" button.

Proceed in the same way to modify or remove a frequency value.

You must insert minimum three frequencies to enable the box below:

Proceed to save the data inside the RX unit, clicking on one of the three button

Note:

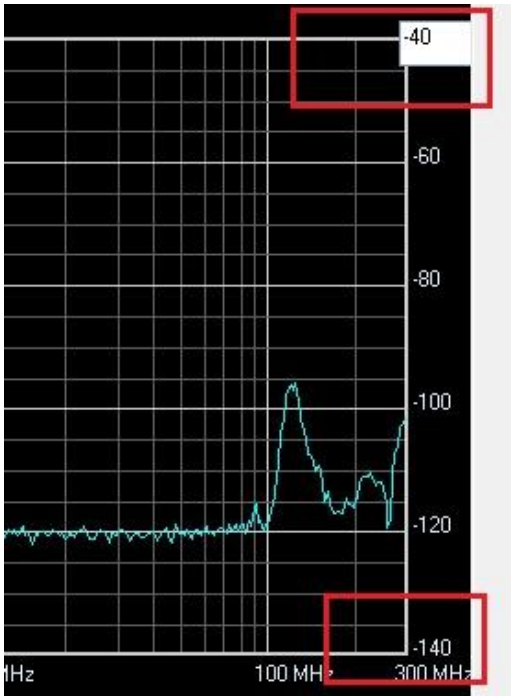
During programming, to enable the functions:

"Unconnected Mode" Make max 20 Frequencies

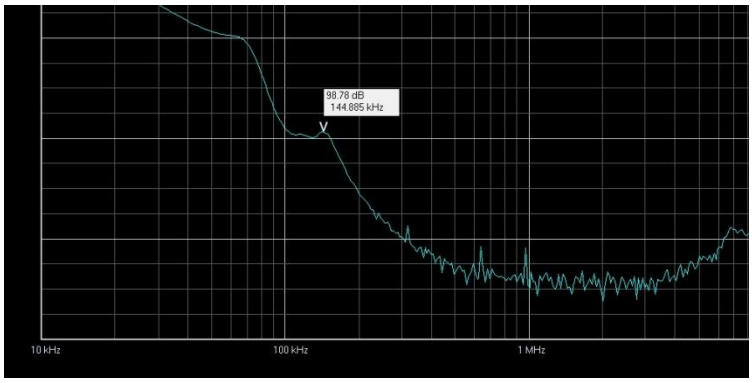
"HiDyn-Mode Make max 30 Frequencies

4.5. Working with the results

- The color of the graphic can be changed from **Options -> Graphic Color**.
- The axis reference can be modified by double clicking the maximum and minimum value of the axis and inserting the desired value.



- You can change the diagram data from Attenuation to Shielding Effectiveness from **Options -> Diagram Style**
- Using the **File** menu you can **save** or **load** a record file, or **export** data in CSV\ASCII format.
- By clicking any point in the graph you can place a marker showing the attenuation of the closest measurement point (if the box is Yellow the measurement point is below the instrument dynamic range)



4.6. Firmware upgrade

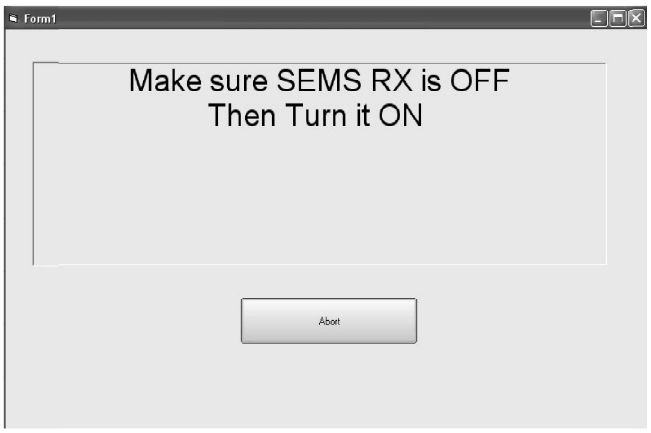
Both the transmitter and the receiver firmware can be updated in the same way.

Be sure that the firmware files are located in the SEMS Software folder.

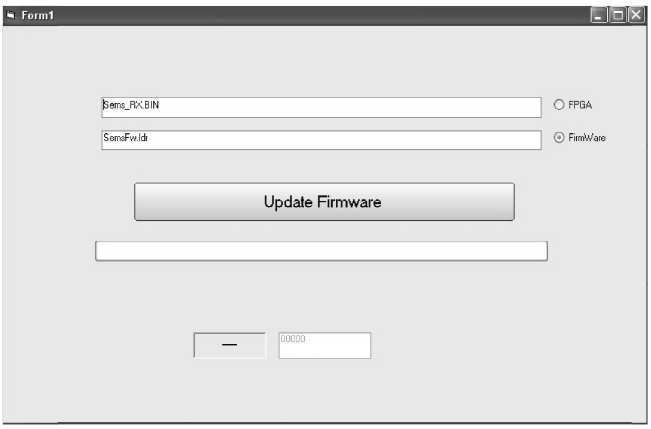
Recharge the unit batteries and connect it to the PC using RS232 cable.
Turn on the unit, run the SEMS Software and set the COM port in the Option menu pressing Select Comm.

To verify the assignation of the COM port assigned by the PC check in the control panel, System, Hardware, peripheral, ports.

To start the firmware update procedure, click the "Tools" button , Update Firmware, and then Update Rx or Update Tx.
Supposing you are updating the Rx unit, the following screen will appear:



Turn off the receiver and then turn it on again.
It will show the upgrade window:



The updatable file (SemsFw.ldr) should be located in the SEMS software directory.
Press the "Update Firmware" button and wait for the loading.
When the upgrade is completed, close the window and turn off the receiver.

Other information: www.gruppompb.com

Technical information: assistenza@gruppompb.com

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